The Role of Intravesical Prostatic Protrusion (IPP) in the Evaluation and Treatment of Bladder Outlet Obstruction (BOO)

Tricia L.C. Kuo,* Jonathan S.M. Teo, and K.T. Foo
Department of Urology, Singapore General Hospital, Singapore

Aims: Intravesical prostatic protrusion (IPP) may be an underutilized modality for the assessment of bladder outlet obstruction (BOO). Pressure flow studies or urodynamics have long been the gold standard for the evaluation of lower urinary tract symptoms (LUTS) in men but are invasive, time-consuming and costly. Potentially, IPP may be a useful adjunct prior to performing urodynamics. **Methods:** Measurement of IPP is taken in the sagittal view, using the transabdominal ultrasound. It is the vertical height from the tip of the protrusion to the base of the prostate. This technique was previously described. We reviewed previous publications that studied the accuracy, positive predictive value and clinical use of IPP. In addition, we noted the comments regarding the challenges of using this technique. **Results:** IPP has been shown to have a positive predictive value of 72% for BOO. It has been calculated to have an area under curve (AUC) value of 0.71 and 0.84 in some stuies. Clinically, it may be used to predict the outcome of a trial without catheter following acute retention of urine. Patients with higher IPP grade were noted to have a higher risk of clinical progression. Studies have also shown that men with higher IPP are poorer responders to medical treatment such as α-blockers. **Conclusions:** Compared to other modalities, the advantage of IPP in assessing BOO may be its easy applicability and non-invasive nature. Therefore, there is a consideration for a larger role of IPP in bedside assessment and management of BOO in daily practice. *Neurourol. Urodynam.* © *2015 Wiley Periodicals, Inc.*

Key words: bladder outlet obstruction; benign prostatic enlargement; benign prostatic hyperplasia; intravesical prostatic protrusion

INTRODUCTION

Bladder outlet obstruction (BOO) is defined as the obstruction of urinary flow at the base of the urinary bladder. In men, this is usually due to an enlarged prostate gland, which is one of the causes of lower urinary tract symptoms (LUTS).

The 6th International Consultation on New Developments in Prostate Cancer and Prostate Diseases recommended evaluation of LUTS by obtaining a medical history, physical examination including a digital rectal examination, assessment of symptom severity with a validated questionnaire, frequency–volume charting, urinalysis, and serum prostate-specific antigen.[1]

However, it may be difficult to clinically differentiate low flow caused by obstruction or detrusor underactivity. Hence, it has been suggested that pressure flow studies or urodynamics be used as the gold standard for the evaluation of LUTS in men.[2,3] However, it is invasive, time-consuming, and costly. Therefore, it is generally indicated for patients who are not responsive to initial conservative treatment or pharmacotherapy, patients with previous intervention, and those of extreme age range and equivocal cases.

Besides performing urodynamic studies, BOO can be evaluated by several non-invasive means. These include prostate volume imaging with transabdominal or transrectal ultrasound, uroflowmetry, and measurement of post-void residual urine. Newer techniques, such as measuring the resistive index of the prostatic artery,[4] detrusor wall thickness,[5] and prostatic urethral angle (PUA),[6] have been evaluated as adjuncts to the evaluation of BOO.

We would like to suggest that the use of the transabdominal measurement of intravesical prostatic protrusion (IPP) is the most valuable and adaptable of all the non-invasive methods mentioned above. IPP could therefore be considered for a larger role in bedside assessment of BOO in daily practice.

Technique of Measurement of IPP

The method of assessment of IPP has been previously described.[7] The measurement is taken from the sagittal view, with the bladder having a volume of 100–200 ml. The IPP is determined by the vertical distance (H) from the tip of the protrusion to the circumference of the bladder at the base of the prostate gland. (Fig. 1)

Rationale

Previous methods for assessing the configuration of the prostate employed transrectal ultrasonography.[8,9] As the transrectal approach was invasive and uncomfortable, the idea for the transabdominal approach was developed. It has been used in clinical practice for years at our institution. The IPP is caused by enlarging median or lateral lobes of the prostatic adenoma, developing along the plane of least resistance. We postulate that this causes distortion of the bladder neck which disrupts laminar flow and funneling, leading to dynamic obstruction.

Christopher Chapple led the peer review process as the Associate Editor responsible for the paper.
Potential conflicts of interest: Nothing to disclose.
*Correspondence to: Tricia Kuo, Department of Urology, Singapore General Hospital, 20 College Road, Academia, Singapore 169856.
E-mail: kuolct@yahoo.com
Received 9 January 2015; Accepted 9 January 2015
Published online in Wiley Online Library (wileyonlinelibrary.com).
DOI 10.1002/nau.22741

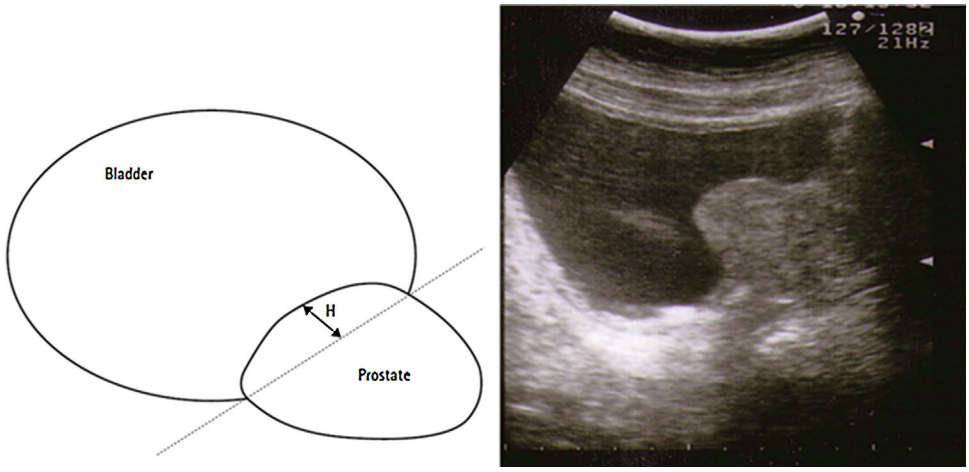

Fig. 1. The grading system for IPP: The vertical distance from the tip of the protrusion to the base of the bladder (H) in the sagittal view using bedside abdominal ultrasonography. Grade I (≤5 mm), Grade II (>5–10 mm), Grade III (>10 mm).

Clinical Application of IPP

In a prospective study by Chia et al., the anatomical configuration of the prostate gland was positively correlated with the presence of BOO. IPP was a statistically significant predictor of BOO.[10] In addition, there is evidence that although prostate volume, serum prostate specific antigen (PSA), and IPP all have a positive correlation with urodynamic-proven BOO, IPP remained the most significant independent index. Lim et al. showed that it had a positive predictive value of 72%, whereas prostate volume and PSA had a positive predictive value of 65% and 68%, respectively.[11]

In an effort to ascertain the accuracy of IPP, recent studies have produced receiver operating characteristic (ROC) curves to calculate area under curve (AUC). One such study reported an of AUC of 0.71 for predicting BOO.[12] Another study reported an AUC of 0.84 when comparing IPP to the BOO index.[6]

IPP has been reported to predict the outcome of a trial without catheter, following acute retention of urine.[13] The failure rate of voiding trial based on grades I, II, and III were 36%, 58% and 67%, respectively. This was statistically significant. Therefore, the authors concluded that patients with grade III IPP would more likely require surgical treatment. The validity of this result has been reproven recently.[14]

The follow-up of 259 patients for 32 months also showed that a higher IPP grade was associated with a higher risk of clinical progression.[15] Those who developed high post-void residual urine (> 100 ml), acute urine retention, or deterioration of at least 4 points in IPSS score were considered to have disease progression. Clinical progression was observed in 52 patients. The proportion of patients with clinical progression was 6% in Grade I, 20% in Grade II, and 44% in Grade III.

In recent years, there has been an interest in the practical application of IPP in the context of risk stratification of patients with benign prostatic obstruction (BPO). The treatment of choice for patients with moderate-to-severe LUTS due to uncomplicated BPO (PV <40 ml, PSA <1.5 ng/ml) is with α-blockers. Studies have shown that men with higher IPP are poorer responders to medical treatment.[16,17] Therefore, we have developed a practical treatment algorithm based on whether the patient has evidence of obstruction (Qmax, PVR), IPP grade, and symptom profile (IPSS, bothersome score).[18]

Challenges Ahead

Despite the growing body of evidence, the concept and use of IPP has been eyed with skepticism by many colleagues. We are not suggesting that IPP replaces urodynamics, but that IPP can be a useful adjunct tool in assessing patients prior to urodynamics.

There is a comparison with other non-invasive parameters, such as bladder wall thickness (BWT) and PUA. BWT is the consequence of BOO and not a causative factor. In addition, bladder wall hypertrophy may be caused by other pathologies; hence, it is not a reliable measure of BOO. PUA is more complicated than IPP to measure. It is the angle between the prostatic urethra and the membranous urethra in the mid sagittal plane, using transrectal ultrasound.[6]

The use of ultrasonography also introduces inter-operator variability in the measurement of IPP. At a larger bladder volume (e.g., 400 ml) and in inexperienced hands, IPP may be underestimated due to the recession of the prostate behind the symphysis pubis. To incorporate the measurement of IPP into routine clinical practice, an ultrasound machine would have to be made available to the clinician. This may not be easily available due to hospital regulations and cost. The initial learning curve may seem daunting at first to the novice.

Bladder contractility is another factor that needs to be considered should a patient have low flow. The underactive bladder (low pressure, low flow) or a decompensated bladder from a long-term prostatic obstruction may present clinical conundrums as to whether such patients will benefit from surgery. Such patients may need urodynamics to ascertain the underlying etiology of their LUTS.

CONCLUSION

The assessment of LUTS in male patients continues to be a challenge despite many developments in the field over the years. The advantage of IPP in assessing BOO may yet lie in its inherent easy applicability and non-invasive nature that enables patient acceptance. IPP has been established to have a role in deciding which patients may benefit from α-blocker therapy, and those in whom early surgery should be carried out. Certainly, more clinical studies with longer term follow-up will contribute to this developing field.

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